CLAIMS

1. A method of forming a ceramic body with nanostructures on at least one surface thereof, the method comprising:

(a) compressing ceramic particulate at a pressure sufficient to form a solid body;

(b) sintering the solid body at a temperature and for a period sufficient to bond the particulate in the solid body into one or more ceramic crystals;

(c) exposing the solid body to a reducing environment at a temperature and for a period sufficient to form nanostructures on at least a portion of the exterior surface of the solid body.

2. The method in accordance with claim 1, wherein the ceramic particulate further comprises titania.

3. The method in accordance with claim 1, wherein the reducing environment further comprises a hydrogen-containing gas flowing over the solid body at a sufficient gas flow rate to form said nanostructures.

4. The method in accordance with claim 1, wherein said pressure is greater than about 0 MPa.

5. The method in accordance with claim 1, wherein said pressure is about 400 MPa.

6. The method in accordance with claim 1, wherein the step of sintering is carried out at a temperature of less than 1,400 degrees Celsius.

7. The method in accordance with claim 6, wherein the step of sintering is carried out at a temperature of about 1,200 degrees Celsius.

8. The method in accordance with claim 7, wherein the step of sintering is carried out for about 6 hours.

9. The method in accordance with claim 3, wherein the hydrogen-containing gas further comprises a majority inert gas and a minority hydrogen-containing gas.

10. The method in accordance with claim 9, wherein the hydrogen-containing gas is hydrogen.

11. The method in accordance with claim 9, wherein the hydrogen-containing gas is water.

12. The method in accordance with claim 9, wherein the step of heat treating is carried out at a temperature of about 700 degrees Celsius.

13. The method in accordance with claim 12, wherein the step of heat treating is carried out for a period of about 8 hours.

14. The method in accordance with claim 1, wherein the step of heat treating is carried out at a flow rate between about 100 and about 500 milliliters per minute.

15. The method in accordance with claim 14, wherein the flow rate is at least about 500 milliliters per minute.

16. The method in accordance with claim 1, wherein the nanostructures formed further comprise nanofibers.

17. The ceramic body produced according to the process of claim 1.

18. A method of forming a metal oxide body with nanostructures on at least one surface thereof, the method comprising:

(a) compressing metal oxide particulate at a pressure greater than 0 MPa to form a solid body;

(b) sintering the solid body in air at a temperature of less than 1,400 degrees Celsius; and then

(c) heat treating the solid body in a gas mixture containing a majority of an inert gas and a minority of a hydrogen-containing gas at a gas flow rate, a temperature and for a period sufficient to cause nanostructures to form on at least a portion of the exterior surface of the solid body.

19. The method in accordance with claim 18, wherein the nanostructures formed further comprise nanofibers.

20. The method in accordance with claim 18, wherein said pressure is about 400 MPa.

21. The method in accordance with claim 18, wherein the step of sintering is carried out at a temperature of about 1,200 degrees Celsius.

22. The method in accordance with claim 21, wherein the step of sintering is carried out for about 6 hours.

23. The method in accordance with claim 18, wherein the inert gas is nitrogen.

24. The method in accordance with claim 18, wherein the hydrogen-containing gas is hydrogen.

25. The method in accordance with claim 18, wherein the hydrogen-containing gas is water.

26. The method in accordance with claim 18, wherein said gas flow rate is between about 100 and about 500 milliliters per minute.

27. The method in accordance with claim 26, wherein the gas flow rate is at least about 500 milliliters per minute.

28. The method in accordance with claim 18, wherein the step of heat treating is carried out at a temperature of about 700 degrees Celsius.

29. The method in accordance with claim 28, wherein the step of heat treating is carried out for a period of about 8 hours.

30. The metal oxide body produced according to the process of claim 18.

31. A method of forming a titania body with nanofibers on at least one surface thereof, the method comprising:

(a) compressing titania particulate at a pressure of about 400 MPa to form a solid body;

(b) sintering the solid body in air at a temperature between about 1,100 and about 1,400 degrees Celsius for about 6 hours; and then

(c) heat treating the solid body in gas containing about 95 percent inert gas and about 5 percent hydrogen with a gas flow rate between about 100 and about 500 milliliters per minute and a gas temperature of about 700 degrees Celsius.

32. The method in accordance with claim 31, wherein the step of sintering is carried out at a temperature of about 1,200 degrees Celsius.

33. The method in accordance with claim 31, wherein the flow rate is at least about 500 milliliters per minute.

34. The titania body produced according to the process of claim 31.

35. A titania solid body having a plurality of fibers on the surface thereof, said fibers having a diameter in a range from about 15 nanometers to about 50 nanometers.

36. The titania solid body in accordance with claim 35, wherein the titania is the rutile phase.

37. The titania solid body in accordance with claim 35, wherein the solid body contains a plurality of titania crystals.

38. The titania solid body in accordance with claim 35, further comprising a pair of electrically conductive bodies having opposite electrical polarity mounted to the body.

39. A sensor comprising:

(a) a titania solid body having a plurality of fibers on the surface thereof, said fibers having diameters in a range between about 15 and about 50 nanometers; and

(b) a resistance measuring means electrically connected to the solid body.